https://doi.org/10.33472/AFJBS.6.2.2024.863-873

African Journal of Biological Sciences

Research Paper Open Access

Nutritional Assessment Of Egyptian National Handball Players and Its Relation to Physical Measurement and Fitness

Ahmed Mahmoud El Adl[1], Mohamed Azmy Khafagy[1], Nadia Abdel Hamid Montasser[1], Hend Magdy Mohamed Gomaa[1]

MD in Public Health, public health & Community Medicine Department, Faculty of Medicine, Mansoura University, Egypt.

*Corresponding author: Hend Magdy Mohamed Gomaa

Email: hendmagdy86@hotmail.com , hendmagdy@mans.edu.eg

Article History

Volume 6, Issue 2, April 2024

Received:19 April 2024

Accepted: 27 May 2024

Published: 27 May 2024

doi: 10.33472/AFJBS.6.2.2024.863-873

Abstract: Background: Several factors contribute to success in sports, and diet is a main component. Nutrition has a main function in athletic performance, and the correct choice of food consumption and intake timing are essential during training and competition. Dietary intake offers the energy athletes require to perform at their best, supports recovery following physical exercises, and plays an essential role in terms of the maintenance of optimum health and preventing injuries. Essentially, the nutrition that an athlete needs is reliant on a number of factors, such as the sport, the athlete's aims, the surroundings, and practical considerations. Aim of study: To assess the nutritional status of Egyptian national handball (HB) players and its correlation with physical measurement and fitness.

Methods: Questionnaire based assessment assessing sociodemographic characteristics, food frequency questionnaire and fat impedance analysis for assessment of nutritional intake and body composition, GAD-7 and PHQ9 were used for mental fitness assessment. Physical measurements and fitness will be assessed using; Vertical jump and 30 meter test for lower limb, Hand grip test and medicine ball throw for upper limb.

Results: A statistically significant difference regarding the frequency of nutrients consumption, with higher frequency was reported by male players compared to female players. Males who report daily consumption of carbohydrates, fatty acids, daily products, processed food, and other food categories were 82.6%, 32.6%, 78.35, 69.6% and 82.6% respectively. No statistically significant difference between males and females regarding the RDEI. However, in both males and females, there is statistically significant higher RDEI reported in days with matches and training compared to days off. Anemia was more prevalent among female players (19.1%) compared to male players (6.5%). On the other hand, there was more male players with high cholesterol, low HDL, and high LDL (8.7%, 4.3% and 8.7% respectively) compared to female players (4.3%, 2.1% and 6.3% respectively). For total depression and anxiety scores; there is no statistically significant difference between male and female players. mild anxiety was detected among 8.6% of total players, 10.6% among female players and 6.5% among male players.

Keywords: *Nutritional Assessment - Egyptian National Handball Players - Physical Measurement - Fitness*

Introduction

Handball (HB) is an Olympic sport that is fast-paced, needs body-contact, played by two opposing teams of seven players on an indoor court over two 30-minute periods. In recent years, the handball game has gained much more popularity, with 19 million players (167 member federations) practicing it all over the world **(1).**

An athlete's performance is reliant on several different factors, which include nutrition. Dietary habits aren't permanent and athletes usually adapt their intake to the training periodization with adoption of special nutritional plans **(2).** The advantages of proper nutrition are multiple and lead to better training, performance and quicker recovery with lower risk of illness or injury **(3).** In contrast, athletes might adhere to diets that don't always meet their energy and nutrient needs **(4)**. A novel systematic literature, revealed that team sport athletes don't meet the nutritional recommendations **(5)**.

Even though there is no distinctive set of nutritional recommendations or consensus in the context of nutritional requirements during exercise, it is commonly agreed that athletes require to take a diet reliable with guidelines for general good health **(6)**.

Physical fitness (PF) could be described as a set of qualities that a subject develops regarding their ability to perform physical activities. Such qualities frequently involve the components of body composition, cardiorespiratory fitness, muscular and endurance, flexibility, agility, balance, coordination, power, and speed **(7)**.

Further distinctive definitions of PF have been described and divided into two classes: (i) health-related PF and (ii) performance-related PF **(8)**. Moreover, mental fitness is defined as the ability to cope with and meet the psychological requirements of life, without unnecessary fatigue or damage to body. This involves the main essential psychological duties of daily living in addition to the more vigorous psychiatric requirements of high performance settings such as advanced learning/studying, examination, competition **(9)**.

Efficient performance in team-based ball games is frequently related to a distinctive association of skilled physical, technical, tactical, and psychiatric qualities. Measurement of such qualities may provide practitioners with insight into sport requirements and performance potential and identify areas for continued player development **(10)**.

By reviewing the current available literatures, there are no Egyptian studies that correlate nutrition with physical measurements and fitness among Egyptian national Handball players. Therefore, the present study was conducted to assess the nutritional status of the players and its relation to physical measurements and fitness.

Aim of study

The overall aim of the study is to assess nutritional status in Egyptian national HB players and its relation to physical measurement and fitness. Objectives: To assess dietary intake, food habits, physical measurements and fitness including medical and PF among studied players and factors affecting it.

2-Methods:

Study type

A Cross sectional study with analytic component.

Study population:

The study was conducted on National handball players during year 2020– 2022.

Sample size determination:

All the Egyptian National Handball Players during study duration were included in the study including 4 teams; boys' team 2000 (birth date 2000), boys' team 2002 (birth date 2002), girls' team 2002 (birth date 2002) and girls' team 2004 (birth date 2004).

Study Tools:

A. Questionnaire based assessment: A Semi-structured questionnaire was designed to assess; sociodemographic data of the players that includes; age, sex, residence & marital status. Present and past history (history of medical diseases, drug intake, surgical history, smoking …etc). Dietary intakes in all participants were recorded by food frequency questionnaire that assess food intake frequency at

daily , weekly and monthly bases **(11)**. Recommendations for subject's daily energy intake, the recommended daily energy intakes (RDEIs) were measured from the following formulas: RDEI for training days and match days = REE×1.4 + (MET × body mass ×h);RDEI for days off = REE ×1.6 **(12)**.

B. Anthropometric measurements comprising; weight, height, body mass index (BMI) and waist hip ratio by method adopted by WHO.

C. Fat impedance analysis was used to detect free fat mass and segmental obesity with the following recorded information (Height (cm), Weight (kg), BMI (kg/m2), Skeletal muscle Mass (SMM), Fat Mass, Percent body fat, BMR (basal metabolic rate), TBW (Total body water), ECW (extracellular water), ICW (intracellular water), ECW ratio and Free fat mass (kg).

D. Laboratory investigations: e.g. hemoglobin level and lipid profile.

E. Physical measurements and fitness were assessed using; Vertical jumb and 30-meter test for lower limb, Hand grip test and medicine ball throw for upper limb

F. Mental fitness was assessed using semi-structured questionnaire ; GAD-7 (General Anxiety Disorder-7) is a 7-item self-reported standardized anxiety questionnaire **(13)** to assess severity of anxiety among studied players . PHQ-9 (Patient Health Questionnaire-9) is a 9-item standardized depression questionnaire **(14)** that was utilized to assess the severity of depression PHQ-9 (Patient Health Questionnaire-9) is a 9-item standardized depression questionnaire **(14)** that was utilized to assess the severity of depression. The scale has nine questions and the members are asked how often in the past two weeks they have developed particulate troubles which include low energy and lack of appetite or overeating. PHQ-9 is answered on a 4-point scale, ranging from zero (not at all) to three (nearly every day). The clinical cutoff for PHQ-9 is all the participants that score ≥ 10 as severe depression

G. Arabic version of GAD-7 and PHQ-9 were used GAD-7 is answered on a 4-point scale ranging from zero-three points for each question and the score combined measures the severity of the anxiety, the response options are from zero (not at all) to three (nearly every day), and the total scale score for GAD-7 ranges from 0-21. The clinical cutoff for GAD-7 is all the members that score ≥ 8 as severe anxiety **(13, 15)**.

Ethical Consideration. This study was approved by the Institutional Research Board (IRB) at Faculty of Medicine, Mansoura University with acceptance code "MD.21.01.414 ". Informed verbal consent was obtained from all the studied participants. Confidentiality and Personal Privacy was respected and the collected data weren't used for any other purposes. Consent was obtained from health authorities of the National Hand ball Player.

Data Analysis.

Data analysis was conducted by SPSS software, version 26 (SPSS Inc., PASW statistics for windows version 26. Chicago: SPSS Inc.). Qualitative data were described using number and percent. Quantitative data were described using mean±SD for normally distributed data after testing normality using Shapiro Wilk test. Significance of the obtained results was judged at the (≤0.05) level. Chi-Square test and Fisher exact tests were utilized to compare qualitative data between groups as appropriate. Mann Whitney U test was utilized to compare between 2 independent groups of non-normally distributed data.

Results

This was a cross-sectional study with an analytic component conducted on national handball players to assess dietary intake, physical fitness and mental fitness. Four teams were included in the study; team 2004 and 2006 (boys and girls). Mean age of the studied female players was 21.65±3.29 years and 16.71±0.46 years for team 2004 and team 2006 respectively. For male players, the mean age was 18.78±0.74 years and 16.52±0.66 years for team 2004 and team 2006 respectively with playing position; 15 goalkeeper, 37 frontal players and 41 back players.

As regard female players; the mean height, weight, BMI, SMM, fat mass, and percent body fat were 173.9±5.8 cm; 71.4 ± 8.4 kg; 23.7±2.2 kg /m2; 28.6 ± 3.0; 19.9 ±4.7; and 27.4±3.7 respectively. In addition, the mean BMR,

TBW, ECW, ICW, and ECW ratio, free fat mass was 1394.4±84.0; 37.3±3.4; 14.3±1.64; 23.0±2.4; and 0.38 ±0.01 respectively. The mean Free fat mass was 60.3±5.4 kg.

As regard male players in the current study; the mean height, body weight, BMI, SMM, fat mass, and percent body fat were 191.2±5.6 cm; 86.69±7.6 kg; 24.5±2.7 kg/m2; 41.7±4.5; 15.2±7.4; and 16.1±5.7 respectively. In addition, the mean BMR, TBW, ECW, ICW, and ECW ratio were 1946.6±132.5; 52.9±9.2; 21.0±2.4; 32.8±3.6; and 0.40±0.07 respectively. The mean Free fat mass was 60.6±4.8 kg.

A statistically significant difference regarding the frequency of nutrients consumption, with higher frequency was reported by male players compared to female players. Males who report daily consumption of carbohydrates, fatty acids, daily products, processed food, and other food categories were 82.6%, 32.6%, 78.35, 69.6% and 82.6% respectively. No statistically significant difference between males and females regarding the RDEI. However, in both males and females, there is statistically significant higher RDEI reported in days with matches and training compared to days off as shown in table (1).

A statistically significant higher feeling down, depressed, or hopeless in some days among female players (12.8%) compared to male players (0.0%). On the other hand, compared to female players, male players have a statistically significant higher frequency of feeling tired or having little energy, and feeling bad about themselves, or that they are a failure or have let themselves or their family down. However, there was no statistically significant difference between males and females regarding the total score of PHQ-9 assessing depression among studied players as shown in table (2).

A non-statistically significant difference between male and female players was detected regarding general anxiety assessed by GAD-7 questionnaire as shown in table (3). A non- statistically significant difference was detected between male and female players regarding laboratory findings including assessment of anemia, and lipid profile. However, anemia was more prevalent among female players (19.1%) compared to male players (6.5%). On the other hand, there was more male players with high cholesterol, low HDL, and high LDL (8.7%, 4.3% and 8.7% respectively) compared to female players (4.3%, 2.1% and 6.3% respectively) as shown in table (4).

As regard female players, the mean height, weight, VMI, SMM, fat mass, and percent body fat were 173.9±5.8 cm; 71.4 ± 8.4 kg; 23.7±2.2 kg /m2; 28.6 ± 3.0; 19.9 ±4.7; and 27.4±3.7 respectively. In addition, the mean BMR, TBW, ECW, ICW, and ECW ratio, free fat mass was 1394.4±84.0; 37.3±3.4; 14.3±1.64; 23.0±2.4; and 0.38 ±0.01 respectively. The mean Free fat mass was 60.3±5.4 kg and as regarding male players, the mean height, body weight, BMI, SMM, fat mass, and percent body fat were 191.2±5.6 cm; 86.69±7.6 kg; 24.5±2.7 kg/m2; 41.7±4.5; 15.2±7.4; and 16.1±5.7 respectively. In addition, the mean BMR, TBW, ECW, ICW, and ECW ratio were 1946.6±132.5; 52.9±9.2; 21.0±2.4; 32.8±3.6; and 0.40±0.07 respectively. The mean Free fat mass was 60.6±4.8 kg.as shown un tables (5 &6)

Concerning physical fitness measurements of female players, the mean vertical jump, handgrip, medicinal ball throw test, and running 30 meters were 36.6±4.5 cm; 32.8±4.6; 4.5±0.6 meter, and 4.9±0.6 seconds respectively and for physical fitness measurements of male players ;the mean vertical jump, handgrip, medicinal ball throw test, and running 30 meters were 49.5±8.4 cm, 57.4±9.3, 6.7 ±0.7 meters and mean running 30 meters is 4.9±0.6 seconds as shown in table (7&8).

Table (1): The frequency of food intake according to sex of the studied players.

Food Category	Frequency of intake	Total (93) N (%)	Females (47) N (%)	Males (46) N (%)	test of significance
Protein	Daily Weekly	73 (78.5) 20 (21.5)	37 (78.7) 10 (21.3)	36 (78.3) 10 (21.7)	$\chi2$=0.003 P=0.957
CHO	Daily Weekly	56 (60.2) 37 (39.8)	18 (38.3) 29 (61.7)	38 (82.6) 8 (17.4)	$\chi2$=19.05 P=0.001*
Fatty acids	Daily Weekly Monthly	23 (24.7) 40 (43.0) 30 (32.3)	8 (17.0) 26 (55.3) 13 (27.7)	15 (32.6) 14 (30.4) 17 (37.0)	$\chi2$=6.25 P=0.04*
Dairy products	Daily Weekly	59 (63.4) 34 (36.6)	23 (48.9) 24 (51.1)	36 (78.3) 10 (21.7)	$\chi2$=8.62 P=0.003*
Processed foods	Daily Weekly Monthly	40 (43.0) 30 (32.3) 23 (24.7)	8 (17.0) 23 (48.9) 16 (34.0)	32 (69.6) 7 (15.2) 7 (15.2)	$\chi2$=26.45 P=0.003*
Other Food	Daily Weekly Monthly	56 (60.2) 29 (31.2) 8 (8.6)	18 (38.3) 23 (48.9) 6 (12.8)	38 (82.6) 6 (13.0) 2 (4.3)	$\chi2$=19.1 P=0.001*
RDEI for days off			2809.0 ± 333.0	2897.6 ± 254.9	t=1.44 P=0.154
RDEI for match & training days			3922.5 ± 188.7	3934.0 ± 168.2	t=0.311 P=0.756
#			t=25.14 p<0.001*	t=37.80 p<0.001*	

$\chi2$: Chi-Square test, t: Student t test, *statistically significant RDEI: required daily expenditure index, # comparison between RDEI for days off and match, training days

Table (2): Depression assessment using Patient Health Questionnaire (PHQ-9) and sex of the studied players.

PHQ-9		Total (n= 93) **n (%)**	Females (n= 47) **N (%)**	Males (n= 46) **N (%)**	Test of significance
Little interest or pleasure in doing things.	Never Some days	83(89.2) 10(10.8)	40(85.1) 7(14.9)	43(93.5) 3(6.5)	$\chi2$=1.69 P=0.193
Feeling down, depressed, or hopeless.	Never Some days	87(93.5) 6(6.5)	41(87.2) 6(12.8)	46(100) 0	$\chi2$=6.28 P=0.012*
Trouble falling or staying asleep, or sleeping too much.	Never Some days More than half days	71(76.3) 19(20.4) 3(3.2)	35(74.5) 10(21.3) 2(4.3)	36(78.3) 9(19.6) 1(2.2)	$\chi2$=0.389 P=0.823
Feeling tired or having little energy.	Never Some days More than half days	79(84.9) 12(12.9) 2(2.2)	35(74.5) 10(21.3) 2(4.3)	44(95.7) 2(4.3) 0	$\chi2$=8.35 P=0.015*
Poor appetite or overeating.	Never Some days More than half days Every day	75(80.6) 15(16.1) 2(2.2) 1(1.1)	42(89.4) 4(8.5) 1(2.1) 0	33(71.7) 11(23.9) 1(2.2) 1(2.2)	$\chi2$=5.34 P=0.149

Feeling bad as regards yourself or you are a failure or have let yourself or your family down.	Never Some days	84(90.3) 9(9.7)	39(83.0) 8(17.0)	45(97.8) 1(2.2)	$\chi2$=5.86 P=0.015*
Trouble concentrating on things, which include reading newspapers or watching TV.	Never Some days More than half days	83(89.2) 8(8.6) 2(2.2)	40(85.1) 5(10.6) 2(4.3)	43(93.5) 3(6.5) 0	$\chi2$=2.59 P=0.273
Moving or speaking so slowly that the peoples may have observed.	Never Some days More than half days	78(83.9) 13(14.0) 2(2.2)	43(91.5) 4(8.5) 0	35(76.1) 9(19.6) 2(4.3)	$\chi2$=4.73 P=0.094
Thoughts that you would be better off dead, or of hurting yourself in some way.	Never Some days More than half days Every day	77(82.8) 13(14.0) 2(2.2) 1(1.1)	42(89.4) 4(8.5) 0 1(2.1)	35(76.1) 9(19.6) 2(4.3) 0	$\chi2$=5.55 P=0.136
total score	Median (min-max)	1(0-8)	1.0(0-8)	1(0-7)	z=0.211 p=0.833
	No depression Mild	88(94.6) 5(5.4)	43(91.5) 4(8.5)	45(97.8) 1(2.2)	$\chi2$FET=1.84 P=0.361

Table (3): Anxiety assessment using the general anxiety disorder-7 questionnaire (GAD-7) and the sex of the studied players.

In the previous two weeks, how often you bothered by these troubles		Total (n=93)	Females (n=47)	Males (N=46)	Test of significance
		N (%)	**N (%)**	**N (%)**	
Feeling nervous, anxious.	Not at all sure Several days Over half the days	75 (80.6) 16 (17.2) 2 (2.2)	36 (76.6) 10 (21.3) 1 (2.1)	39 (84.8) 6 (13.0) 1 (2.2)	$\chi2$=1.11 P=0.574
Not able to stop or manage worrying	Not at all sure Several days	77 (82.8) 16 (17.2)	38 (80.9) 9 (19.1)	39 (84.8) 7 (15.2)	$\chi2$=0.252 P=0.615
Worry too much as regards different things	Not at all sure Several days Over half the days	65 (69.9) 21 (22.6) 7 (7.5)	34 (72.3) 10 (21.3) 3 (6.4)	31 (67.4) 11 (23.9) 4 (8.7)	$\chi2$=0.318 P=0.853
Trouble relaxing	Not at all sure Several days Over half the days	66 (71.0) 21 (22.6) 6 (6.5)	29 (61.7) 15 (31.9) 3 (6.4)	37 (80.4) 6 (13.0) 3 (6.5)	$\chi2$=4.82 P=0.09
So restless that it's hard to sit still	Not at all sure Several days Over half the days Nearly every day	68 (73.1) 21 (22.6) 3 (3.2) 1 (1.1)	37 (78.7) 8 (17.0) 2 (4.3) 0	31 (67.4) 13 (28.3) 1 (2.2) 1 (2.2)	$\chi2$=3.04 P=0.385
Becoming easily annoyed or irritable	Not at all sure Several days Over half the days	71 (76.3) 20 (21.5) 2 (2.2)	34 (72.3) 12 (25.5) 1 (2.1)	37 (80.4) 8 (17.4) 1 (2.2)	$\chi2$=0.916 P=0.633
Feeling afraid as if something awful may occur	Not at all sure Several days Over half the days	73 (78.5) 14 (15.1) 6 (6.5)	35 (74.5) 7 (14.9) 5 (10.6)	38 (82.6) 7 (15.2) 1 (2.2)	$\chi2$=2.78 P=0.3249
total score	**Median (min-max)**		2 (0-7)	1 (0-6)	z=0.679 p=0.497

	No anxiety Mild anxiety	85(91.4) 8(8.6)	42(89.4) 5(10.6)	43(93.5) 3(6.5)	$\chi2$=0.501 P=0.479

$\chi2$: Chi-Square test, FET: Fisher exact test, Z: Mann Whitney U test *statistically significant

Table (4): The laboratory findings and the sex of the studied players.

Laboratory findings	Total (n=93)	Females (N=47)	Males (N=46)	Test of significance
	N (%)	**N (%)**	**N (%)**	
Anemic	12 (12.9)	9 (19.1)	3 (6.5)	$\chi2$=3.29 P=0.07
High cholesterol	6 (6.5)	2 (4.3)	4 (8.7)	$\chi2$=0.759 P=0.384
Low HDL	3 (3.2)	1(2.1)	2 (4.3)	FET=0.367 P=0.617
High LDL	7 (7.5)	3 (6.4)	4 (8.7)	FET=0.179 P=0.714

$\chi2$: Chi-Square test, FET: Fisher exact test

Table (*5*): The physical measurements of the studied female players.

Physical measurements	Female players		Total
	2004	2006	
Height (cm)	173.5 ± 5.7	174.3 ± 5.9	173.9 ± 5.8
Weight (kg)	70.6 ± 9.1	*72.2 ± 7.8*	*71.4* ± 8.*4*
BMI (kg/m2)	*23.4* ± 2.*1*	*23.9 ± 2.3*	23.7 ± 2.2
Skeletal muscle Mass	28.4 ± 2.9	28.8 ± 3.2	28.6 ± 3.0
Fat Mass	19.1 ± 4.4	20.7 ± 5.0	19.9 ± 4.7
Percent body fat	26.8 ± 3.3	28.0 ±3.9	27.4 ± 3.7
BMR (basal metabolic rate)	1371.0 ± 63.4	1416.8 ± 95.9	1394.4 ± 84.0
TBW (Total body water)	37.0 ±3.8	37.6 ± 4.2	37.3 ± 4.0
ECW (extracellular water)	14.2 ± 1.6	14.5 ± 1.7	14.3 ± 1.6
ICW (intracellular water)	22.9 ± 2.3	23.2 ± 2.5	23.0 ± 2.4
ECW ratio	0.38 ± 0.01	0.38 ± 0.01	0.3*8* ± 0.01
Free fat mass (kg)	60.4 ± 5.0	60.2 ± 5.9	60.3 ± 5.4

Data expressed as mean±SD

BMI: body mass index, BMR (basal metabolic rate), TBW (Total body water), ECW (extracellular water), ICW (intracellular water) ECW Ratio is the proportion of extracellular water to the total body water.

Table (*6*): The physical measurements of the studied male players.

Physical measurements	Male players		Total
	2004	**2006**	
Height (cm)	192.0 ± 5.2	190.3 ± 5.9	191.2 ± 5.6
Weight (kg)	*88.1 ± 7.1*	*85.3 ± 8.0*	*86.69 ±7.6*
BMI (kg/m2)	*24.6 ± 2.7*	*24.3 ± 2.6*	24.5 ± 2.6
Skeletal muscle Mass	*42.9* ± 5.1	40.4 ± 3.5	41.7 ± 4.5
Fat Mass	14.0 ± 7.6	*16.40 ± 7.2*	15.2±7.4
Percent body fat	14.9 ± 6.3	17.4 ± 4.8	16.1 ± 5.7
BMR (basal metabolic rate)	1972.5 ± 144.2	1920.7 ± 117.1	1946.6 ± 132.5
TBW (Total body water)	55.5 ± 6.6	50.3 ± 10.8	52.9 ± 9.2
ECW (extracellular water)	21.7 ± 2.6	20.4 ± 1.9	21.0 ± 2.4
ICW (intracellular water)	33.8 ± 4.1	31.8 ± 2.8	32.8 ± 3.6
ECW ratio	0.39 ± 0.01	0.41 ± 0.10	0.40 ± 0.07
Free fat mass (kg)	60.1 ± 4.0	61.1 ± 5.5	60.6 ± 4.8

Data expressed as mean±SD

BMI: body mass index, BMR (basal metabolic rate), TBW (Total body water), ECW (extracellular water), ICW (intracellular water) ECW Ratio is the proportion of extracellular water to the total body water.

Table (*7*): Physical fitness measurements of the studied female players.

Physical fitness Measurements	Female players		Total females
	Team 2004	**Team 2006**	
Vertical jump (cm)	*3*6.7 ± 5.4	36.5 ± 3.5	36.6 ± 4.5
Handgrip	34.4 ± 5.1	31.3 ± 3.5	32.8 ± 4.6
Medicinal ball throw test (meter)	4.6 ± 0.8	4.3 ± 0.4	4.5 ± 0.6
Running 30 meters (seconds)	4.5 ± 0.3	5.2 ± 0.6	4.9 ± 0.6

Table (*8*): Physical fitness measurements of the studied male players.

Physical fitness measurements	Male players		Total males
	Team 2004	**Team 2006**	
Vertical jump (cm)	50.1 ± 6.9	49.0±9.84	49.54±8.40
Handgrip	60.1 ± 8.2	54.74±9.73	57.41±9.28
Medicinal ball throw test (meter)	6.8 ± 0.6	6.69 ± 0.8	6.7 ± 0.7
Running 30 meters (seconds)	4.2 ± 0.3	4.0 ± 0.5	4.*1* ± 0.*4*

Discussion

The present study shows a statistically significant difference regarding the frequency of nutrients consumption, with higher frequency was reported by male players compared to female players. Males who report daily consumption of carbohydrates, fatty acids, daily products, processed food, and other food categories were 82.6%, 32.6%, 78.35, 69.6% and 82.6% respectively.

In contrast to the present findings ; no difference in Carbohydrate intake was detected between male and female players **(16, 17)** and also the study carried out by Teraž and Meulenberg **(18)** who detect no statistically significant difference between males and female players as regard fat intake.

However; in consistent with our results the study carried out by **McClung et al. (19)** who reported that female athletes evade consuming different meat dishes, owing to the associations of such products with dietary fats **(19)**.

In the context of handball players, there are no special recommendations for energy and macronutrient intake available from the previous literatures. On the other hand, we measured the average RDEIs for training days, match days and days off from the individual FFM of each male player and for female players and shows no statistically significant difference between males and females regarding the RDEI. However, in both males and females, there is statistically significant higher RDEI reported in days with matches and training compared to days off. Mean RDEI for females are 2809.0 ± 333.0 and 3922.5 ± 188.7 versus 2897.6 ± 254.9 and 3934.0 ± 168.2 for males assessed at days off and match & training days, respectively.

This come in agreement with the study carried out by **Teraž and Meulenberg (18)** who assess nutritional intake of slovenian semi-professional handball players and found that RDEI was 4054 ± 248 kcal versus 3413±193 kcal for training days& match days and days off among male players and 3602 ± 218 kcal and for days off 2646±108 kcal, correspondingly for female players. These measured RDEIs revealed significant differences between the days, ($p<0.025$).

In contrast, **Suzuki et al. (20)**, have used Nelson and Keytel's equation and estimated comparable TEE values of 3000±228, 3322±253 and 2933±208 kcal during three days of training in female handball court players, giving 1126±116, 1478±209 and 1103±143 kcal to energy expenditure per handball training session on all three days, fluctuations caused by the performance of a double session on the second day.

In addition, **Silva et al. (21)** noticed TEE values of 3126±520 kcal for female and 3892±596 kcal/day for male indoor handball athletes at the beginning of the season, with a considerable increase in TEE during the primary competition phase to values of 3549±317 kcal/day for females and 4526 ± 483 kcal/day for males, results that underline the significance of proper dietary planning which takes into consideration the various stages of the season.

As regard mental fitness of the studied players; a statistically significant higher feeling down, depressed or hopeless in some days among female players (12.8%) compared to male players (0.0%). On the other hand, compared to female players, male players have a statistically significant higher frequency of feeling tired or having little energy, and feeling bad about themselves, or that they are a failure or have let themselves or their family down.

On the other hand, there was no statistically significant difference between males and females regarding the total score of PHQ-9 assessing depression among studied players. For total depression and anxiety scores; there is no statistically significant difference between male and female players. Mild anxiety was detected among 8.6% of total players, 10.6% among female players and 6.5% among male players.

In agreement with the present results was the study carried out by **Jörundsdóttir (2017)** to assess prevalence of anxiety and depressive manifestations among HB players in Iceland and found that most of players revealed little or no manifestations of anxiety and depression. Severe anxiety and depression were detected among 4% & 3.7%, respectively. As regard gender difference ; the difference was only significant for GAD-7 **(22)**.

Also, other studies support the previous findings; **Schaal et al. (23)** have demonstrated that anxiety and depressive manifestations were identified in women twice as frequently as in men, likewise; **Viðarsdóttir (24)** conducted their study on Icelandic professional ball sports athletes and **Pálsson (25)** conducted their study on Icelandic footballers and revealed that females scored higher on anxiety and depressive manifestations.

In the present study; physical fitness measurements of male players illustrate that vertical jump, handgrip, medicinal ball throw test, and running 30 meters were 49.5±8.4 cm, 57.4±9.3, 6.7 ±0.7 meters and mean running 30 meters is 4.9±0.6 second and for females; 36.6±4.5 cm; 32.8±4.6; 4.5±0.6 meter, and 4.9±0.6 seconds for vertical jump, handgrip, medicinal ball throw test, and running 30 meters, respectively.

In line with our results was the study carried out by **Buchheit et al. (26)** who displayed a mean of 44.9cm among seven well-trained male handball players, and, **Nikolaidis et al. (27)** who presented a mean of 43.6cm among adult players with a weekly training volume of 8.4±2.0 hours. Lower values were detected by **Massuca et al. (28)** who reported that vertical jump test was 38.4 among male players and the study carried out by **Moncef et al. (29)** who found vertical jump 39.7 cm among tunisian elite male handball players.

Study limitations

Food diaries don't all the time indicate the real food intake, as self-report is subject to recall mistakes and recording bias, both general limitations of this approach and no availability to quantitative assessment of food consumption. Particular subjects have recorded very low energy intake with regard to their real body composition. For a more precise data and a reliable consideration of the nutritional condition of handball players on match days, their nutrition should be recorded preferably over a whole season, in particular during multiple matches.

Conclusion and recommendations

Health education targeting athletes about healthy nutritional options should be available at training sites with more studies targeting athletes to make reference values for dietetic needs.

References:

1. **Pavlović L, Stojiljković N, Aksović N *et al.* (2018):** Diurnal variations in physical performance: Are there morning-to-evening differences in elite male handball players? *Journal of human kinetics*, 63(1): 117-26.
2. **Thomas DT, Erdman KA, Burke LM (2016):** Nutrition and athletic performance. *Med Sci Sports Exerc*, 48(3): 543-68.
3. **Committee MCotIO (2011):** IOC consensus statement on sports nutrition 2010. *www olympic org/Documents/Reports/EN/CONSENSUS-FINAL-v8-en pdf*.
4. **Spronk I, Heaney SE, Prvan T *et al.* (2015):** Relationship between general nutrition knowledge and dietary quality in elite athletes. *International journal of sport nutrition and exercise metabolism*, 25(3): 243-51.
5. **Jenner SL, Buckley GL, Belski R *et al.* (2019):** Dietary intakes of professional and semi-professional team sport athletes do not meet sport nutrition recommendations—a systematic literature review. *Nutrients*, 11(5): 1160.
6. **Pendergast D, Meksawan K, Limprasertkul A *et al.* (2011):** Influence of exercise on nutritional requirements. *European journal of applied physiology*, 111: 379-90.
7. **Farley JB, Stein J, Keogh JW *et al.* (2020):** The relationship between physical fitness qualities and sport-specific technical skills in female, team-based ball players: a systematic review. *Sports medicine-open*, 6: 1-20.
8. Wormhoudt R, Savelsbergh GJ, Teunissen JW *et al.* The athletic skills model: optimizing talent development through movement education: Routledge; 2017.
9. **Robinson PL (2014):** Conceptualising and measuring mental fitness. *University of Wollongong , Department of Psychology, University of Wollongong*.
10. **Lidor R, CôTé J, Hackfort D (2009):** ISSP position stand: To test or not to test? The use of physical skill tests in talent detection and in early phases of sport development. *International journal of sport and exercise psychology*, 7(2): 131-46.
11. **FAO (2018):** Dietary Assessment: A resource guide to method selection and application in low resource settings. Rome.
12. **Debeljak P, Debeljak D, Hlastan-Ribič C *et al.* (2004):** Referenčne vrednosti za vnos hranil [Reference values for nutrient intakes]. Ljubljana: Ministrstvo za zdravje.
13. **Spitzer RL, Kroenke K, Williams JB *et al.* (2006):** A brief measure for assessing generalized anxiety disorder: the GAD-7. *Archives of internal medicine*, 166(10): 1092-7.

14. **Kroenke K, Spitzer RL, Williams JB (2001):** The PHQ-9: validity of a brief depression severity measure. *Journal of general internal medicine*, 16(9): 606-13.
15. **AlHadi AN, AlAteeq DA, Al-Sharif E *et al.* (2017):** An arabic translation, reliability, and validation of Patient Health Questionnaire in a Saudi sample. *Annals of general psychiatry*, 16: 1-9.
16. **Caprio J, da Costa JPM, Franco G *et al.* (2018):** Perfil alimentar e antropométrico de um time de atletas de handebol da categoria júnior. *Revista Brasileira de Nutrição Esportiva*, 12(70): 238-45.
17. **de Sá C, Monteiro S, Osório S *et al.* (2021):** Dietary intake of young Portuguese handball players. *Motricidade*, 17(3): 255-61.
18. **Teraž K, Meulenberg C (2019):** Nutritional intake of Slovenian semi-professional handball players. *Annales Kinesiologiae*, 10(2): 129-47.
19. **McClung JP, Gaffney-Stomberg E, Lee JJ (2014):** Female athletes: a population at risk of vitamin and mineral deficiencies affecting health and performance. *Journal of Trace Elements in Medicine and Biology*, 28(4): 388-92.
20. **Suzuki H, Ueno Y, Takanouchi T *et al.* (2020):** Nitrogen balance in female Japanese national handball players during training camp. *Frontiers in Nutrition*, 7: 59.
21. **Silva AM, Matias CN, Santos DA *et al.* (2017):** Compensatory changes in energy balance regulation over one athletic season. *Med Sci Sports Exerc*, 49(6): 1229-35.
22. Jörundsdóttir SM. Prevalence of anxiety and depression symptoms among handball players in Iceland and their attitude towards seeking psychological help 2017.
23. **Schaal K, Tafflet M, Nassif H *et al.* (2011):** Psychological balance in high level athletes: gender-based differences and sport-specific patterns. *PloS one*, 6(5): e19007.
24. Viðarsdóttir ML. Algengi þunglyndis-og kvíðaeinkenna hjá íslenskum atvinnumönnum í boltaíþróttum 2015.
25. Pálsson E. Prevalence of anxiety and depression symptoms among football players at a top level in Iceland 2016.
26. **Buchheit M, Leprêtre P-M, Behaegel A *et al.* (2009):** Cardiorespiratory responses during running and sport-specific exercises in handball players. *Journal of Science and Medicine in Sport*, 12(3): 399-405.
27. **Nikolaidis P, Ingebrigtsen J (2013):** The relationship between body mass index and physical fitness in adolescent and adult male team handball players. *Indian J Physiol Pharmacol*, 57(4): 361-71.
28. **Massuça LM, Fragoso I, Teles J (2014):** Attributes of top elite team-handball players. *The Journal of Strength & Conditioning Research*, 28(1): 178-86.
29. **Moncef C, Said M, Olfa N *et al.* (2012):** Influence of morphological characteristics on physical and physiological performances of tunisian elite male handball players. *Asian journal of sports medicine*, 3(2): 74.